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*Indian Standard*

**SPECIFICATION FOR  
ELECTRICAL TIMBER RELAYS FOR  
INDUSTRIAL PURPOSES**

**PART III ELECTRONIC**

**( First Reprint AUGUST 1993 )**

**UDC 621'318'562'7 : 621'318'57**

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**BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
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*Indian Standard*SPECIFICATION FOR  
ELECTRICAL TIMER RELAYS FOR  
INDUSTRIAL PURPOSES

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# *Indian Standard*

## SPECIFICATION FOR ELECTRICAL TIMER RELAYS FOR INDUSTRIAL PURPOSES

### PART III ELECTRONIC

## 0. FOREWORD

**0.1** This Indian Standard ( Part III ) was adopted by the Indian Standards Institution on 29 September 1981, after the draft finalized by the Relays Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** Electrical timer relays for industrial purposes are now being extensively used in various industries for different controls. A number of industrial relays for such purposes are now being manufactured indigenously in India.

**0.3** This standard ( Part III ) covers electronic time delay relays for industrial purposes. Other types of relays in this series are covered in the following standards:

IS : 5834 ( Part I ) - 1973 Electrical timer relays for industrial purposes : Part I Pneumatic

IS : 5834 ( Part II ) - 1973 Electrical timer relays for industrial purposes : Part II Motorized

**0.4** The electronic time delay relays are used for industrial applications such as motor control panels, process operations, machine tools, plastic moulding machines, textile machinery and sugar plants.

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2 - 1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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\*Rules for rounding off numerical values ( revised ).

## 1. SCOPE

**1.1** This standard ( Part III ) covers electronic time delay relays for providing adjustable time delay to control various types of industrial circuits of nominal voltage not exceeding 650 V.

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the definitions given in IS : 1885 ( Part IX )-1966\*, in addition to the following shall apply.

**2.1 Time-Delay Relay** — A relay whose operation or resetting is intentionally time-delayed. The time delay of the relay may be fixed or adjustable.

**2.2 Time Delay Contact** — A contact intended to be used for controlling an external circuit and operated by the time-delay relay.

**2.3 Instantaneous Contact** — A contact working in conjunction with the relay and actuated without any intentional time delay and serving to control operation of other device(s) ( *see also* 8.1 of IS : 3231 - 1965† ).

**2.4 Initial Condition** — The specified condition which the relay leaves in order to complete its designated function in a given contact circuit.

NOTE — The specification of the initial condition should take into account the energizing quantities including their values, contact circuits, etc.

**2.5 Operated Condition** — The condition of a relay as long as the designated function is completed in a given contact circuit.

**2.6 Rated Voltage** — The value of the voltage upon which the performance of the relay is based. For polyphase circuits, it is stated as the voltage between phases.

**2.7 Rated Current** — The value of current upon which the performance of the relay is based. It is stated by the manufacturer and takes into account the rated voltage and frequency.

**2.8 Rated Power Consumption** — The power absorbed by the circuits of the relay expressed in volt-amperes at rated voltage, rated current and rated frequency.

**2.9 Rated Frequency of Operations** — The number of cycles of operation which a relay can perform per hour under specified conditions to make and break successfully under specified conditions without significant damage to the contact.

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\*Electrotechnical vocabulary : Part IX Electrical relays.

†Specification for electrical relays for power system protection.



**2.10 Recovery Time** — It is the minimum time between two successive operations such that the repeat accuracy is maintained.

**2.11 Rated Making Capacity** — The maximum current which the time-delay contact is able to make successfully under specified conditions without significant damage to the contact after the specified number of operations.

**2.12 Rated Breaking Capacity** — The maximum current which the time-delay contact is able to break successfully under specified conditions without significant damage to the contact after the specified number of operations.

**2.13 On-Delay ( Delay on Pick-Up )** — 'On-Delay' signifies that the specified time of the time-delay relay is initiated upon energization or closing of an initiating contact.

**2.14 Off-Delay ( Delay on Drop-Off )** — 'Off-Delay' signifies that the specified time of the time-delay is initiated upon de-energization or on opening of an initiating contact.

**2.15 Time-Delay** — 'Time-Delay' is the time interval between the instant of energization ( for the 'On-Delay' relay ) or de-energization ( for the 'Off-Delay' relay ) of the relay and the actuation of the time-delay contacts.

**2.16 Setting Accuracy** — The setting accuracy of the time-delay relay is defined as:

$$\text{Setting accuracy} = \frac{T_o - T_s}{T_s} \times 100 \text{ percent}$$

( in percentage of set value )

where

$T_o$  = operating time, and

$T_s$  = setting time.

**2.17 Repeat Accuracy** — The repeat accuracy of a time-delay relay is one half of the variation between the maximum and minimum observed operating times at any particular setting, divided by the mean of all the observed operating times and the quotient multiplied by 100 and expressed in terms of plus or minus percentage.

Mathematically it is expressed as:

$$\text{Repeat accuracy} = 1/2 \frac{(T_1 - T_2)}{\sum \frac{T}{n}}$$

where

$T_1$  = maximum operating time in seconds,

$T_2$  = minimum operating time in seconds,

$T'$  = actual operating time in seconds for each operation, and

$n$  = number of operations.

**2.18 Type Tests** — Tests carried out to prove conformity with the requirements of this specification. These are intended to prove general quality and design of a given type of relay.

**2.19 Routine Tests** — Tests carried out on each relay to check requirements likely to vary during production.

### 3. CONSTRUCTION

#### 3.1 Enclosure

**3.1.1** The relay may be housed in an enclosure or provided with a cover, so as to prevent the ingress of dust and moisture.

**3.1.2** The cover of the protective enclosure, if provided, shall be so secured to its base that it shall not be accidentally loosened or detached owing to effects of operation of the relay. Also it should be so secured that it is not possible to open it without the use of tools unless suitable means are provided to prevent accidental contact with live parts.

**3.1.3** The enclosure, if metallic, shall be so constructed that, unless marked to the contrary, it may be earthed.

#### 3.2 Terminals

**3.2.1** Terminal connections shall be such that conductors may be connected by means of screws or other suitable means so as to ensure that the necessary contact pressure is maintained permanently.

**3.3 Means of Time-Delay Setting** — Where the time delay is intended to be adjustable, the relay shall be provided with simple means for adjusting the time delay of the relay. Any time adjustment means requiring rotary motion shall be so designed that the time interval increases with clockwise direction and decreases with anti-clockwise direction.

**3.4** Timing chambers shall be completely enclosed to prevent ingress of dust and moisture.

## 4. RATINGS

**4.1 Rated Voltages** — The rated voltage of the relay shall be one of the following values:

For ac — 110, 240 and 415 volts.

For dc — 24, 48, 110 and 220 volts.

NOTE — Preferable dc supply should not have a ripple content more than 3 percent

where percentage ripple =  $\frac{\text{Peak value} - \text{dc component}}{\text{dc component}} \times 100$

**4.2 Preferred Rated Continuous Current of the Contact** — The manufacturer shall state the rated continuous current, which shall preferably be chosen from the following:

1, 1.25, 1.6, 2.0, 2.5, 3.15, 4, 5, 6.3, 8 amperes their decimal multiples and sub-multiples.

**4.3 Time-Setting Range** — The time-setting range of the relay shall be stated by the manufacturer.

**4.4 Resetting Time** — The resetting time of the relay shall be stated by the manufacturer.

**4.5 Recovery Time** — The recovery time of the relay shall be stated by the manufacturer.

**4.6 Rated Frequency** — The rated frequency shall be the standard frequency of 50 Hz.

**4.7 Rated Making and Breaking Capacities** — The manufacturer shall state the rated making and breaking capacities of the relay contacts.

**4.8 Rated Frequency of Operations** — The rated frequency of operations shall preferably be chosen from the following:

6, 30, 120, 600, 1 200, 1 800, 3 600, 7 200, 12 000, 18 000, 36 000, 72 000 operations per hour.

**4.9 Electrical Endurance Test** — The relays shall be capable of operating at the rated frequency of operations and under the specified making and the breaking capacities for the number of operations stated by the manufacturer.

**4.10 Limits of Temperature Rise** — The insulated winding of the relay ( where used ) shall not exceed the temperature rise limits specified in Table 2 of IS : 5834 ( Part I )-1973\* where measured by variation of resistance over a reference ambient temperature of 40°C.

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\*Specification for electrical timer relays for industrial purposes : Part I Pneumatic.

## **5. OPERATING CHARACTERISTICS AND LIMITS OF ERROR**

**5.1** The relay shall operate satisfactorily within the setting accuracy, where declared by the manufacturer at the rated voltage, rated frequency and at the reference temperature.

**5.2** The declared repeat accuracy of the relay operating time at rated voltage, at rated frequency and at reference temperature shall be within the limits claimed by the manufacturer.

**5.3** The percentage change in the set operating time under the following conditions shall not exceed the limits declared by the manufacturer:

- a) Change in supply voltage — 20 to + 10 percent of rated voltage.
- b) Change in supply frequency —  $\pm 5$  percent of rated frequency.
- c) Change in ambient temperature — - 5 to 45°C.

## **6. NORMAL SERVICE CONDITIONS**

**6.1** Unless otherwise stated, the relays shall be suitable for use under the service conditions specified in IS : 3231-1965\*.

## **7. MARKING**

**7.1** The following information shall be marked distinctly and permanently on every relay preferably in position where it is visible when the relay is installed:

- a) Reference to this Indian Standard, that is Ref IS 5834 ( Part III )-1981†;
- b) Manufacturer's name or trade-mark, type designation or serial number of relay;
- c) Rated setting range;
- d) Rated voltage;
- e) Rated frequency; and

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\*Specification for electrical relays for power system protection.

†Specification for electrical timer relays for industrial purposes : Part II Motorized.

## 7.2 The relay may also be marked with the Standard Mark.

**NOTE** — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 8. TESTS

**8.0** Tests are classified into two classes, namely, type tests and routine tests as in 8.0.1 and 8.0.2.

**8.0.1 Type Tests** — The following shall comprise type tests :

- a) Temperature-rise test ( 8.1 ),
- b) Verification of rated making and breaking capacities ( 8.2 ),
- c) Electrical endurance test ( 8.3 ),
- d) Verification of limits of operation ( 8.4 ),
- e) Verification of resetting time ( 8.5 ),
- f) Dielectric test ( 8.6 ),
- g) Impluse voltage test ( optional ) ( 8.7 ),
- h) High frequency disturbance test ( 8.8 ),
- j) Insulation resistance test ( 8.9 ),
- k) Setting accuracy test ( 8.10 ), and
- m) Repeat accuracy test ( 8.11 ).

**8.0.2 Routine Tests** — The following shall comprise routine tests:

- a) Verification of limits of operation ( 8.4 ),
- b) Dielectric test ( 8.6 ), and
- c) Setting accuracy test ( 8.10 ).

**8.1 Temperature-Rise Test** — The temperature-rise test shall be carried out in accordance with 4.10 of IS : 5834 ( Part I ) - 1973\*.

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\*Specification for electrical timer relays for industrial purposes : Part I Pneumatic.

## 8.2 Verification of Rated Making and Breaking Capacities

**8.2.1** These tests are meant to verify that the relay contacts are capable of making and breaking the rated currents for a minimum number of operations as specified in IS : 3231-1965\*. When practicable, tests for making and breaking capacities may be combined.

**8.2.2** The tests shall be carried out with ac or dc with ohmic and inductive loads in accordance with Table 10 of IS : 3231-1965\* and for the specified rated making and breaking capacities.

**8.2.3 Test Circuit** — The power supply used for verification of rated and breaking capacities shall have adequate capacity.

The test circuit may consist of either a motor or air-cored reactors in series with resistors. Resistance and reactance of the test circuit shall be adjustable to satisfy the conditions given in **8.2.2**.

**8.2.3.1 Test conditions** — The tolerance on the test conditions shall be as follows:

- |                            |                 |
|----------------------------|-----------------|
| a) Frequency of operation  | $\pm 5$ percent |
| b) Control circuit voltage | $\pm 2$ percent |

**8.3 Electrical Endurance Test** — The test shall be conducted for the number of operations claimed by the manufacturer at the specified frequency of operations. The test circuit conditions shall be as that mentioned in **8.2.3** and **8.2.3.1**. During the test, the routine maintenance instructions recommended by manufacturer shall be carried out. The relay should be considered to have passed the test if it meets the stipulations of IS : 3231-1965\*.

**8.4 Verification of Limits of Operations** — It shall be verified that the relay contacts open and close satisfactorily at any value between 85 and 110 percent of rated voltage.

**8.5 Verification of Resetting Time** — The time taken by the relay to return to its initial condition from its operated condition by sudden removal of the characteristic quantity shall be determined. This shall not be more than the value declared by the manufacturer.

**8.6 Dielectric Test** — The dielectric test shall be carried out as specified in IS : 3231-1965\*.

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\*Specification for electrical relays for power system protection.

## 8.7 Impulse Voltage Test

8.7.1 This test shall be carried out subject to agreement between the manufacturer and the user. The test is performed to determine the effects of high voltage surges on the relay.

8.7.2 The requirements and method of impulse voltage test shall be in accordance with 5.1 of IS : 8686-1977\*.

## 8.8 High Frequency Disturbance Test

8.8.1 This test shall be regarded as type test and carried out when agreed to between the manufacturer and the user.

8.8.2 The requirements and method of test of high frequency disturbance test shall be in accordance with 5.2 of IS : 8686-1977\*.

## 8.9 Insulation Resistance Test

8.9.1 The insulation resistance of the relay shall be measured after the application of 500 V dc between the terminals of each winding and the metal case or aluminium foil enclosing the insulated body.

8.9.2 The insulation resistance of the relay so measured shall not be less than 10 megohm.

8.10 Setting Accuracy Test — The relay shall be set at the maximum of the setting range over which the manufacturer declares the setting accuracy or any other setting agreed to between the manufacturer and the user, and shall be operated 5 times under the conditions given in 5.1. The time delay shall be measured for each operation. The setting accuracy shall be determined in accordance with 2.17. In each case, it shall be within the limits declared by the manufacturer.

8.11 Repeat Accuracy Test — Relay shall be set at four different settings, that is minimum operating time, maximum operating time and two intermediate positions, covering the entire setting range and shall be operated 20 times under the conditions given in 5.2. The time delay shall be measured for each operation. The repeat accuracy should be determined in accordance with 2.18. It shall be within the limits declared by the manufacturer.

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\*Specification for static protective relays.

( Continued from page 2 )

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Printed at Simco Printing Press, Delhi, India

**AMENDMENT NO. 1 SEPTEMBER 1993**  
**TO**  
**IS 5834 ( Part 3 ) : 1981 SPECIFICATION FOR**  
**ELECTRICAL TIMER RELAYS FOR INDUSTRIAL**  
**PURPOSES**

**PART 3 ELECTRONIC**

( Page 4, clause 2.0 ) — Substitute 'IS 1885 ( Part 9 ) : 1986' for 'IS 1885 (Part IX) -1966'.

( Page 4, foot-note ) — Substitute 'Electrotechnical vocabulary: Part 9 Electrical relays ( first revision )' for 'Electrotechnical vocabulary: Part IX Electrical relays'.

( Page 5, clause 2.17, seventh line ) — Replace as follows:

$$\text{Repeat accuracy} = \frac{(T_1 - T_2)}{2 \frac{T^1}{n}} \times 100 \text{ percent}$$

( Page 8, clause 5.3 ) — Replace as follows:

'The percentage change in the set operating time under the following conditions shall not exceed the limits declared by the manufacturer:

- |    |                               |   |
|----|-------------------------------|---|
| a) | Change in supply voltage      | -15 percent + 10 percent of rated voltage |
| b) | Change in supply frequency    | ±5 percent of rated frequency             |
| c) | Change in ambient temperature | -5°C to 45°C                              |

[ Page 8, clause 7.1 (a), fifth line ] — Delete '†' mark.

( Page 8, foot-note marked with '†' ) — Delete.

( Page 9, clause 7.2 ) — Substitute the following for the existing:

'7.2 The relay may also be marked with Standard Mark.

**AMENDMENT NO. 2   APRIL 1994**  
**TO**  
**IS 5834 ( Part 3 ) : 1981   SPECIFICATION FOR**  
**ELECTRICAL TIMBER RELAYS FOR INDUSTRIAL**  
**PURPOSES**

**PART 3   ELECTRONIC**

[ Page 5, clause 2.17, seventh line ( see also Amendment No. 1 )] —  
Replace 'Repeat accuracy' equation as follows:

$$\text{Repeat accuracy} = \frac{T_1 - T_2}{2 \sum \frac{T}{n}}$$

in place of

$$\text{Repeat accuracy} = \frac{T_1 - T_2}{2 \frac{T^1}{n}}$$

( Page 8, clause 5.3 ) — Replace as follows:

'The percentage change in the set operating time under the following conditions shall not exceed the limits declared by the manufacturer:

- a) Change in supply voltage - 15 percent to +10 percent of rated voltage  
in place of

Change in supply voltage - 15 percent to +10 percent of rated voltage

( Page 9, clause 7.2 ) — Substitute the following for the existing:

**7.2   BIS Certification Marking**

**7.2.1** The relay may also be marked with Standard Mark.

The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.'

( ETD 35 )

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